Cost-effectiveness of routine immunization to control Japanese encephalitis in Shanghai, China
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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
Two alternative vaccination programmes were compared. In one programme, an inactivated vaccine (P3) was administered in a five-dose schedule of two doses one week apart at 12 months, followed by single doses at the ages of 2, 6 and 10 years. In the other programme, a live attenuated vaccine (SA 14-14-12) was administered in a single dose at 12 months, followed by another dose at 2 years of age.

Type of intervention
Primary prevention.

Economic study type
Cost-utility analysis.

Study population
The study population comprised a hypothetical cohort of neonates who were followed up to the age of 30 years.

Setting
The setting was the community. The economic study was carried out in China.

Dates to which data relate
The effectiveness evidence dated from 1951 to 2002. The resource use data appears to have been collected between 1990 and 1997. The price year was 1997.

Source of effectiveness data
The effectiveness data were derived from a review or synthesis of completed studies, augmented by estimates of effectiveness based on opinion.

Modelling
A decision tree model was used to estimate the clinical and economic consequences of the two vaccination programmes and the comparator option for a hypothetical cohort of neonates followed until they were 30 years old.

Outcomes assessed in the review
The following model parameters were derived from published studies:
the annual incidence of Japanese encephalitis;
vaccination efficacy and adverse events per scheduled dose;
fatality from Japanese encephalitis;
the percentage of Japanese encephalitis cases with long-term disability; and
the age-related disability adjustments.

Study designs and other criteria for inclusion in the review
Not reported.

Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
Twenty-seven primary studies were used to derive the model parameters.

Methods of combining primary studies
Not reported.

Investigation of differences between primary studies
Not reported.

Results of the review
The following model parameters were identified in the base-case:

the annual incidence of Japanese encephalitis was 32.5 per 100,000 population under 10 years;
the efficacy of the P3 vaccine was 50% after dose 1, 85% after dose 2, 95% after dose 3, and 98% after dose 4 and 5;
the efficacy of the SA 14-14-12 vaccine was 95% after dose 1 and 98% after dose 2;
non-severe and severe adverse events following P3 vaccination were 1.4 per 10,000 and 0.5 per 10,000, respectively;
non-severe adverse events following SA 14-14-12 vaccine were 0.5 per 10,000;
fatality from Japanese encephalitis was 25%;
the proportion of Japanese encephalitis cases with long-term disability was 30%; and
the disability-adjusted weight was 0.616 for age 0 - 14 years and 0.613 for age 15 - 30 years.
Methods used to derive estimates of effectiveness
The authors assumed vaccination coverage rates based on historical patterns.

Estimates of effectiveness and key assumptions
It was assumed that vaccination coverage per scheduled dose of both vaccines was 98%.

Measure of benefits used in the economic analysis
Since the health benefits were not combined with the cost data the study was, in effect, a cost-consequences analysis.

Direct costs
The direct costs of the health care payer were included. The unit costs were clearly identified. The costs of vaccination were taken from the actual costs incurred in China's Expanded Programme on Immunisation. Staff at the Expanded Programme on Immunisation estimated the treatment costs of vaccination-associated adverse events. This comprised the costs of the vaccines, storage, transportation and other supplies. The costs of treating Japanese encephalitis were calculated using charges for hospital stays, drugs, medical examinations, laboratory tests and medical personnel, based on data from the Shanghai Medical School Children's Hospital. Senior neurologists estimated outpatient resource use for Japanese encephalitis-associated disability following interviews with patients and their families. The unit costs for outpatient care were taken from charges at the Shanghai Medical School Hua Shan Hospital. Future costs were discounted at a rate of 3% per annum. The price year was 1997.

Statistical analysis of costs
The cost data was treated deterministically.

Indirect Costs
No indirect costs were included in this study. This is in line with the perspective adopted.

Currency
US dollars ($).

Sensitivity analysis
One-way sensitivity analyses were undertaken to assess variability in the data. The ranges used in the sensitivity analysis were reported, but their source was not.

Estimated benefits used in the economic analysis
Not relevant.

Cost results
The total cost of treating Japanese encephalitis and its sequelae over a 30-year period in a non vaccinated population was $738,315 per 100,000.

The total costs of vaccination with the P3 vaccine and treatment costs associated with Japanese encephalitis and its sequelae over the same period were $390,069 per 100,000.

The same cost estimate for vaccination with the SA 14-14-12 vaccine was $225,859 per 100,000.
Synthesis of costs and benefits
The health benefits and costs were not combined. The sensitivity analysis confirmed that both vaccination strategies were cost-saving in comparison with no vaccination. The SA 14-14-12 vaccination was more cost-saving than the P3 vaccine at all points in the sensitivity analysis.

Authors' conclusions
Both vaccination strategies are cost-saving in comparison with no vaccination.

CRD COMMENTARY - Selection of comparators
The authors compared the two vaccination strategies with a do-nothing option of no vaccination, as this represented the current situation in a number of Asian countries where Japanese encephalitis is endemic. You should consider whether this is an appropriate comparator in your setting.

Validity of estimate of measure of effectiveness
The effectiveness data used in this study were derived from prior studies or were assumed by the authors. The paper did not report whether a systematic review of the literature was undertaken to identify the studies. In addition, since there were no details of the methods used to select or combine the studies, it was not possible to assess the validity of the sources used. Where the authors assumed the model parameters, they considered historical data to inform their choices. These estimates were investigated in sensitivity analyses. Given the lack of reporting on review methods, it was not possible to evaluate whether the best available evidence had been used in the analysis.

Validity of estimate of measure of benefit
No summary measure of health benefit was combined with the cost data identified in this study. Consequently, the study was, in effect, a cost-consequences analysis. The reader is thus referred to the comments in the 'Validity of estimate of measure of effectiveness' field (above).

Validity of estimate of costs
The perspective of the health care purchaser was adopted in this study. As such, all appropriate costs appear to have been included in the estimation of the total cost. The paper did not provide a breakdown of resource use, but the unit costs were set out separately. The resource use data were taken from a variety of sources using several different methods. The price year was clearly reported, making future reflation exercises possible. Future costs were appropriately discounted. One-way sensitivity analyses, which assessed the variability the cost data used in the study and, therefore, the study findings, were undertaken.

Other issues
The conclusions drawn in this paper accurately represent the analysis presented. The authors compared their study with another study on vaccination against Japanese encephalitis. They compared their findings but noted that their study covered a considerably longer time period. In addition, the authors noted that their study was specific to China but commented that the study findings may be of interest to other Asian countries where Japanese encephalitis is endemic.

Implications of the study
The authors did not make any recommendations for further research or changes in practice.

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